To: Tina Laidlaw/MO/R8/USEPA/US@EPA[]
From: "Blend, Jeff"
Sent: Tue 7/12/2011 2:25:46 PM
Subject: Public text
DEMONSTRATION_Public wastewater plants.docx

Tina:

Attached is our text for the public demonstration. A few numbers will change slightly due to tweaks in the spreadsheet you and I have been working on. The results will not change.

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Demonstration of Significant and Widespread Economic Impacts to Montana That Would Result if Base Numeric Nutrient Standards had to be Met Today--DRAFT

Summary

An analysis was undertaken to determine the degree and extent of economic impact that would occur in Montana if base numeric nutrient standards had to be met today by all publically owned wastewater treatment plants (WWTPs). DEQ used technical data from engineers and published papers, U.S. census and demographic data, DEQ staff, EPA staff, and information from Montana WWTP operators to carry out the analysis.. The analysis showed that communities across Montana would bear substantial and widespread economic impacts (i.e., economic hardship) from having to meet base numeric nutrient standards today. DEQ estimates that greater than 95% of Montana communities would bear substantial and widespread economic burden if required to meet the criteria today.

To demonstrate substantial and widespread impacts for affected public WWTPs in Montana requires three steps. The first step is to demonstrate that meeting the numeric nutrient criteria (also referred to here as base numeric nutrient standards) today would cost more than 2% of of a community's Median Household Income (MHI) for all or almost all Montana communities with WWTPs that would have to meet numeric nutrient criteria. "Almost all" in this demonstration means 95% or more of affected communities. The 2% threshold posing 'Significant' economic hardship to a community is found in EPA's Interim Economic Guidance (USEPA 1995). The second step is to demonstrate that all or almost all Montana communities would pass the 'secondary score' levels for Substantial effects as defined in EPA's guidance (USEPA 1995). Note that the secondary scoring process used in this paper was the one refined by DEQ, a stakeholder group, and EPA in 2008-9, and was considered acceptable (actually, an improvement) by EPA. These first two steps, if both were met statewide, would constitute a 'Significant' finding for Montana communities with affected WWTPs. The third step, assuming that a Significant impact is found for Montana communities, is to demonstrate a 'Widespread' finding for all or almost all Montana communities with WWTPs that would have to meet the base numeric nutrient criteria.

DEQ simplified the first step by taking a sample of 10 WWTPs, estimated the cost for each to meet numeric nutrient criteria or a level less stringent than thecriteria, and calculated the percent of MHI it would cost to pay existing wastewater fees plus the new fees that would be needed. The costs calculated with help from EPA and engineers doing work for Montana WWTPs.

Existing wastewater fees in Montana average about 0.8% of MHI across the state, with larger towns paying as little as 0.3% and smaller towns paying up to 1.96% (Figure 1). Most towns currently pay less than 1.5% MHI, with the majority of those paying less than 1.0 of MHI for wastewater treatment.

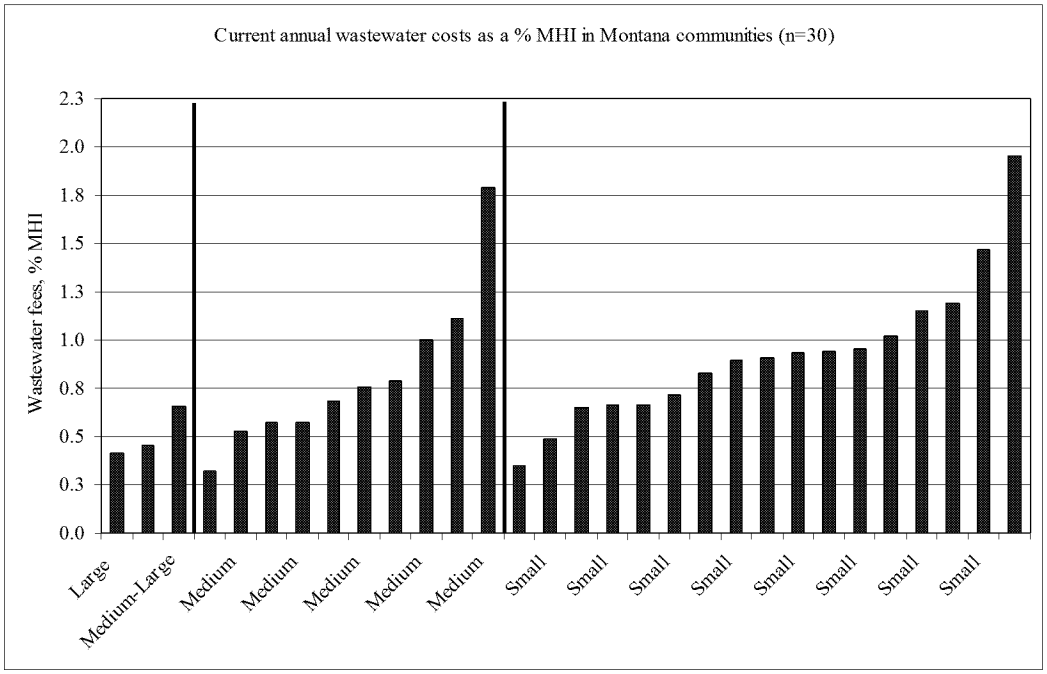

Figure 1. Wastewater rates as a function of median household income as of 2008. Communities were selected via a stratified random process for three groups (small, medium, and large communities).

Complimenting DEQ's case studies, EPA developed a spreadsheet example of the largest towns in Montana and what it would cost in MHI to meet base numeric nutrient standards. EPA's results were based on cost data from the Interim WERF study: "Finding the Balance Between Wastewater Treatment Nutrient Removal and Sustainability, Considering Capital and Operating Costs, Energy, Air and Water Quality and More" (Draft 2010). EPA assumed that reverse osmosis (RO) would be the technology used to meet base criteria. A 'Pilot Study for Low Level Phosphorus Removal' ([2010] Hal Schmidt, P.E.MWH Americas, Inc.), conducted in Florida shows that for TP, TN, and other micro-pollutants, RO was indeed the most effective method for removing TN and TP (better than membrane bioreactor, MBR). Dave Clark of HDR Engineering agreed that RO is the treatment that results in the lowest TN levels, and that the WERF report accurately reflects capital and operations costs for RO. Thus, this study backs up EPA's assumption of using RO technology for this demonstration of economic hardship. (It is important to note that this does not mean that Montana WWTPs would use RO to meet LOT or nutrient criteria in practice.)

From our analysis is it clear that small towns in Montana, which make up a majority of WWTPs, would not be able to afford to meet base numeric nutrient standards if the 2% MHI threshold is used, per EPA's guidance. In 2008, for example, DEQ estimated that the town of Circle would have to pay over 5% MHI for upgrades that would not even get them to the base numeric nutrient standards. In fact, moderate levels of treatment that don't come close to meeting base numeric nutrient standards would probably result in 2% MHI or more for a majority of Montana towns. Butte, the fifth largest town in Montana, is a good example of this. The current $27 million upgrade which will not meet base numeric nutrient standards, but will result in the best current nutrient treatment in Montana, will likely push

Butte residences to or over the 2% MHI (using the EPA spreadsheet). This does not include RO technology, which would push wastewater fees even higher. Four out of five other smaller towns in Montana would pay well over 2% MHI just to upgrade to meet a level of nutrient removal much less stringent than the base numeric nutrient standards. The one town that would not reach 2% MHI, Columbia Falls, was based on cost estimates to meet a level of treatment which was a magnitude less stringent than base numeric nutrient standards. Because actual data from engineers was available to assess compliance with these more-coarse levels of treatment (i.e., that would not meet the standards but could meet SB 367 general variance requirements), those data were used verses a rough guess at meeting base numeric nutrient standards. Results from DEQ calculations and discussions with engineering consultants working on these plants are shown in Table 1.

Table 1. Estimated cost relative to community median household income for Montana communities to remove nutrients to the concentrations specified for each.

WWTP	Level of Treatment (approx)	Percent MHI to meet level of treatment
(*Base Criteria*	*0.3-1 mg TN/L; 0.1-0.03 mg TP/L*)	
Phillipsburg	15 mg TN/L; 2 TP mg TP/L	5.24
Cut Bank	Unquanitified by EPA	3.54
Deer Lodge	10 TN; 1 TP	4.05
Manhattan	10 TN; no TP removal	3.38
Columbia Falls	4-8 TN; 0.5-1.0 TP	1.34

In EPA's spreadsheet example, they looked at costs that would be incurred by the largest seven Montana towns (Billings, Missoula, Great Falls, Bozeman, Butte, Helena, and Kalispell). The wisdom of doing this is that if any WWTPs could afford meeting numeric nutrient criteria, it would be these seven towns due to the already-sophisticated systems in place and/or large populations across which costs can be dispersed (economies of scale). EPA and DEQ determined that Missoula, and Great Falls already meet nutrient criteria due to the large rivers that their treated water flows into and the allowed mixing zones. Thus, those two towns would not immediately need a general variance and would not experience Significant and Widespread impacts from having to meet numeric nutrient criteria at this time. However, we still looked at Great Falls as an example. To meet base numeric mutrient criteria, Helena, Butte, Kalispell, Bozeman, Billings and Great Falls households would have to pay 1.53%, 2.62%, 1.61% and 2.23%, 2.41% and 4.21% MHI respectively if they had to meet base numeric nutrient standards today using the EPA spreadsheet. The Butte example includes a current upgrade that is occurring at this time but is not yet reflected in existing bills. Differences in the MHI levels for these six towns include current levels of nutrient treatment, town population, current MHI, and current wastewater fees. That said, four of the six largest towns in Montana would score over the 2% MHI

threshold to meet base criteria.

EPA's cost examples included capital costs, energy and chemical operations costs, and brine disposal costs (RO technology would require brine disposal). Labor and maintenance costs were not included, so the cost estimates for these towns may be low. Also, the way in which municipalities fund upgrades in Montana may cost more than what was reported in the WERF study, making the cost estimates potentially low.[1] Tina Laidlaw of EPA has suggested that the costs in the EPA spreadsheet for the six large towns may be overestimated, since the capital costs they came up with from the WERF report assumed that plants were starting from scratch, rather than upgrading from current levels. DEQ argues that this overestimation of costs probably does not exist as retrofits to existing plants could be more expensive than starting from the ground up.

If four out of six of the largest towns would experience over 2% MHI to meet criteria, it is almost certain that all the smaller towns in Montana would too, due to very limited economies of scale, and the examples above (Table 1) demonstrate this to be the case. As shown with the six examples of smaller towns, most of those towns go well over 2% MHI just to meet general variance criteria which are a magnitude less stringent than the numeric nutrient criteria. Thus, over 95% of all towns in Montana would experience over 2% MHI to meet numeric numeric criteria. So, step one demonstrates a Significant Impact in terms of the MHI screener of 2% MHI for almost all Montana WWTPs.

Step two involves a community's current economic health, and is the other component needed to demonstrate Substantial effects. Montana's secondary test, as modified from the 1995 EPA Economic Guidance (modified with EPA approval to better fit Montana's needs), looks at the following levels of each economic metric for a given town and compares the town level to the state average.

- Poverty Rate
- Low and Moderate Income rate
- Unemployment Rate
- Median Household Income
- Current local tax and fee burden

Each of these factors are scored as either weak, average or strong compared to state averages. The five

[1] Municipalities (cities and towns) typically would fund treatment plant improvements with a revenue bond. Revenue bonds require coverage in excess of the debt service payment in the 115-125% range. The State Revolving Fund requires 125% coverage. What this means is that the rates to the customers need to be set up so that they include 125% (in the case of an SRF loan) of the debt service payment. This would be on top of O&M and other costs. The reason for this requirement is to cover the potential customers that don't pay their monthly user bills. In addition to the coverage, municipalities are required to have one year's worth of principal and interest. Sometimes they end up borrowing that from DEQ as well. This generally does not apply to water and sewer districts that are statutorily able to issue general obligation bonds, which are tax-backed. So, they don't need coverage beyond 100% nor do they need to post the debt service reserve (one year's principal and interest). (Paul LaVigne, DEQ)

scores are averaged to come up with an overall numerical rank and this rank is used in a 'secondary score matrix' taken from the EPA Guidance that combines the MHI screener result and the secondary score numerical rank. The stronger the secondary score numerical rank is (the average score of the five economic metrics), the more able a town is to pay for additional wastewater costs—meeting numeric nutrient criteria in our case. The lower the MHI screener result is for existing wastewater fees plus new fees needed to meet nutrient criteria, the more able a town is to pay additional wastewater costs. The MHI level to meet higher standards and secondary score are put into the matrix given in the EPA Guidance (Figure 2). The matrix determines if a town is Significantly impacted by an increase in wastewater fees.

	Municipal Preliminary Screener		
	Less than 1%	**1% to 2%**	**Greater than 2%**
Secondary score			
Less than 1.5	Borderline	X	X
Between 1.5 and 2.5	$	Borderline	X
Greater than 2.5	$	$	Borderline

Figure 2. Assessment of Substantial Impacts Matrix.

If a town falls into the 'X' or 'Borderline' category in the matrix, then the town is considered to be 'substantially' affected—that is, the effect on the town of additional wastewater fees is Substantial, and a town can move on to the Widespread determination. Allowing the 'Borderline" designation to be considered Substantial was decided by the Montana Nutrient Work Group, and was not opposed by EPA.

Most towns in Montana fall into the two cells in the matrix that are red in color within the blue circle, and thus are Substantially affected by having to meet numeric nutrient criteria (Figure 2). This is because every town that DEQ has looked at would entail at least a 1% MHI to meet base nutrient criteria (plus existing wastewater fees) and almost all would entail at least a 2% MHI. Referring to the above matrix, that means that the only way a town in Montana could 'fail' the Substantial Impacts Matrix, and not experience a Substantial impact would be if their MHI cost was less than 2% to meet nutrient criteria and their secondary score was greater than 2.5. Out of 27 Montana towns sampled to determine sample secondary score numerical ranks, most scored between 1.6 and 2.2, with only 1 town (Ismay) scoring at 2.6 or an overall Strong score. Ismay, MT would not score below 2% MHI to meet base nutrient criteria, so even Ismay passes the Substantial Impacts Matrix. The large towns of Billings,

Bozeman, Helena, Great Falls and Missoula all scored either a 2.0 or 2.2 in their secondary score rank, and would all entail at least 1% MHI (most well over 2% MHI) to meet base numeric standards. (HDR, however, recently calculated a secondary score of 2.8 for Billings, which still puts them in the Borderline category). Thus, virtually every town in Montana would pass the Substantial Impacts matrix, and thus experience Substantial impacts from having to meet numeric nutrient criteria. In fact, about 90% of towns would likely fall into one of the two boxes in the matrix that are shaded red. Thus, step two is completed.

Because step one and step two are met for more than 95% of Montana towns, a substantial impact has been demonstrated. We have shown this to be the case for virtually every town in Montana.

Step three involves widespread impacts and must be met to complete a demonstration of economic hardship. The Widespread Impact question for each town is: What are the ripple effects of the substantial impact on the local area? The main components of this question consist of economic linkages to the area and town makeup (or makeup of the 'local area' which could include up to a 60 mile radius of the most remote towns in Montana or only the town itself in certain cases). There exist no economic ratios for the Widespread test as there are for Substantial tests within EPA guidance. A widespread analysis must define the geographic area where project costs pass through to the local economy, and must consider baseline economic health of the community/area, population and economic trends, and the socioeconomic well-being of the community before and after wastewater fee increases. Socioeconomic impacts are evaluated for Widespread Impacts by their cumulative effect and by Best Professional Judgment of the analyst.

For the entire state of Montana, DEQ has simplified this analysis to look at all towns at once. The Widespread argument for Montana is narrative as there are no numeric tests for Widespread. The geographic region of Montana WWTPs consists of two main types of towns. Most towns are small and rural (e.g., Ekalaka) or small and a suburb of a larger town (e.g., East Helena). There are over 100 of these towns with affected WWTPs. The other type of town is larger. About 15-20 towns are medium to large in Montana, and are more urban-based with more diverse economies. Six towns have more than 20,000 in population and a seventh town (Kalispell) is at an estimated 19,927 (Montana CEIC, Census 2010). Another ten towns with affected WWTPs are at over 5,000 in population.

DEQ believes that at least 95% of affected Montana towns would experience widespread impacts by having to meet base numeric nutrient standards today. DEQ's Widespread argument is as follows.

- The fact that almost every town in Montana would experience a 2% or greater impact on MHI from having to meet numeric nutrient criteria suggests Widespread impacts across the state. Often times, the MHI would be much greater than 2%. Only Helena and Kalispell would possibly pay less than 2% MHI out of over 100 towns.
- Most small towns (< 5000 people) are agriculturally-based with treatment lagoons, and would certainly feel widespread impacts from meeting the criteria. For one, the cost relative to MHI will likely be much higher than 2% for the majority of these towns considering that most have lagoons that would need complete, major upgrades and most have small populations to spread

that cost. Also, many of these towns are losing population and business, and a substantial increase in the wastewater bill could tip the scales for a percentage of residences and commercial businesses (businesses that rely on peoples, disposable income and that would see increases in their own wastewater bill). Because most small towns do not have diverse economies, even a small decrease in business and in population can have a large effect on small towns that are struggling. For example, some small towns have less than 10 businesses total. Small towns make up about 80-85% of the total number of WWTPs. Smaller towns like Sidney or Big Sky may be an exception (e.g. not experience Widespread impacts) due to the booming oil economy that is happening right now in Sidney and high incomes in Big Sky, but would likely be two of the only exceptions for smaller towns.

- Less disposable income to Montana citizens that rely on WWTPs (the majority of Montanans) and the ripple effects of this to local businesses are the main Widespread impacts in Montana from having to meet nutrient criteria today. Montana is currently 41st in the nation in per capita income as of 2009 at $22,881 (Data Set: 2005-2009 American Community Survey 5-Year Estimates, American Community Survey, Montana CEIC). Prices in Montana are about average for the U.S. across all goods. Montanans on average do not have as much disposable income as the average American, and may have slightly higher living expenses due to long travel distances and higher heating bills (which may be balanced by lower air conditioning bills and virtually no private swimming pools). It is estimated that all towns in Montana will experience at least 2% MHI in their total wastewater bill to meet base numeric nutrient standards, or at least 1.2% MHI more than they are currently paying *on average* (current bills average about 0.8% across Montana). Thus, most wastewater bills would at least triple, and some could go up by as much as 8000% as estimated for Phillipsburg. In a state with less disposable income than average, a change in disposable income of 1.2% or more (up in the double digits in some cases) will produce widespread effects on households and businesses (some businesses more than others).
- Larger towns over 5,000 in population will likely show mixed results in terms of Widespread impact. The six large towns affected by nutrient criteria would experience Widespread impacts in terms of disposable income, but probably would not see their economy collapse. In other words, these large towns would not shut down, but certain residences and businesses would experience substantial impacts. Another 12 or so medium to large towns would probably experience Widespread impacts overall for the same reasons as discussed above, but less severe impacts than the over 100 smaller towns with affected WWTPs. The current Recession could complicate these effects. Even if one-third of these medium to large towns—a reasonable guess is five medium to large towns plus Sidney--did not experience Widespread impacts, more than 95% of Montana's affected towns still would meet the 'almost all' threshold for Widespread impacts. Again, it is assumed that all towns under 5,000 persons would experience Widespread impacts.

Thus step three is complete, and a demonstration of Significant and Widespread impacts to the state of Montana for public WWTPs has been demonstrated.